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Hypomyelinogenesis congenita in Sheep

BY

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SUMMARY.—A congenital disease of lambs is described, characterised clinically by trembling or choreiform twitching, ataxia and sometimes shaking of the head, and histologically by defective formation of myelin in an otherwise normal nervous system. The cause is unknown.

SINCE 1955 the authors have seen a few cases of a disease of new-born lambs, not apparently recorded before. Despite the paucity of epidemiological data available, the disease appears to be a distinct, clinico-pathological entity and is therefore presented here.

First Outbreak. Yorkshire, 1955

The first cases submitted for diagnosis came from a flock of 104 first- to third-crop Leicester ewes served by Oxford tups, which had bred normally in the previous year. After uneventful pregnancy and parturition, 6 second- or third-crop ewes produced trembling lambs : 1 lot of triplets, 2 pairs of twins and 3 single lambs. Within the next 3 weeks 16 more trembling lambs were born, bringing the total incidence in the lamb crop to 26. The symptoms were described as continuous trembling affecting the whole body, but not so severe as to prevent the lambs from standing. Affected lambs were able to suck and had a good appetite ; defaecation and micturition functioned normally and the voice was unaffected. Two of the triplets died soon after birth ; 3 more lambs became available for examination and the remainder were said to thrive and improve. The copper levels of blood and liver samples from 2 affected lambs were within the normal range.

Necropsy Findings

No gross abnormalities were found in the lambs examined. Bacteriological examination of the brain and spinal cord was negative.

Second Outbreak. Isle of Wight, 1956

Five cases of congenital trembling occurred in the progeny of 150 Cluns brought to the Isle of Wight from Wales the previous autumn. The symptoms were described as almost continuous trembling involving the whole body and head. Affected lambs moved with a very erratic gait, were inco-ordinate and inclined to hop or jump with the hind legs. From time to time one would give its head a particularly violent shake which seemed to steady the trembling for about half a minute. The trembling stopped when the lambs were asleep. In spite of the nervous symptoms the lambs followed their dams, sucked and grew at the normal rate. They were all single lambs, from first- or second-crop ewes.

* Formerly at the Veterinary Investigation Centre, Leeds.

Necropsy Findings

Only 1 lamb which died when about 4 months old was available for laboratory examination. The carcase was grossly normal. The copper content of a portion of liver was 410 p.p.m. D.M.

Third Outbreak. Monmouthshire, 1958

Five affected lambs were born to a mixed flock of 55 ewes—Radnor, Radnor × Welsh Mountain, Radnor × Suffolk and a few Kerry crosses. The Suffolk tup had been bought as a yearling in 1956 and had sired the 1957 and 1958 lambs. The disease had not been seen in 1957.

Case 1. A single lamb born of a Radnor × Suffolk ewe which was one of triplets. The 2 other sibling ewes produced normal lambs. At birth the lamb shook so violently it had to be held to the teat in order to suck. Gradually it improved till it could suck unaided. There was an almost continual movement of the head from side to side and when it walked or ran, inco-ordination of the hind legs became apparent, together with convulsive, choreiform movements. Otherwise the lamb was strong and lively.

Cases 2 and 3. Two of triplets—the third had died at birth. Both presented a state of perpetual movement similar to severe and persistent chorea. One lamb was so unsteady that it could not stand or suck without assistance. It died when 3 days old and provided the only, immediately available material for study. No gross evidence of disease was seen at necropsy and the copper content of a sample of liver was 138 p.p.m. per D.M., which is within the normal range. The other lamb presented a picture similar to Case 1 and, like it, survived. The dam was a Radnor × Welsh Mountain ewe bought as a yearling in the autumn of 1956. Twin lambs born to it in 1957 and sired by the same Suffolk tup were normal.

Cases 4 and 5. Twin lambs born to a Kerry cross ewe. One showed head shaking and inco-ordination similar to the other affected lambs ; its twin was only slightly inco-ordinate. The dam had been bought 6 years ago and produced normal lambs each year until these affected twins.

Subsequent enquiries in the autumn revealed that the 4 lambs which were alive at the time of the consultation had improved and survived, although still not completely normal. They were purchased and brought to the Weybridge laboratory when about 5 months old, at which time the symptoms were intermittent head shaking, mild, coarse trembling and, when the lambs were hustled, slight ataxia. This ataxia appeared to be confined to the hind quarters and included an occasional hopping movement or a peculiar rotating movement of the pelvis about the long axis of the vertebral column. When the animals were at rest, symptoms were slight and caused neither distress nor inconvenience. The 4 lambs were normally developed for their age and in good condition. One was killed to provide material for histology. A sample of its liver contained 280 p.p.m. D.M. of copper. The remaining 3, 1 ram and 2 ewes, are alive at the time of writing.

Neuropathology

Brain and portions of spinal cord were available from only 6 of these cases, 4 of them lambs a few days old, one of them 4 months and one 5 months. Irrespective of origin or age, they appeared to be grossly normal in size, general architecture and texture, except that the distinction between white and grey matter was less vivid than normal. Specimens were fixed in 10 per cent. neutral formol-saline and representative paraffin sections prepared.

In the cerebral sections of 5 of the brains examined, little or no myelin has been demonstrated by Loyez's haematoxylin or the copper phthallocyanin technique. The outline of the fibre sheaths can be seen in the gyral cores, but myelin staining is either very light on occasional fibres or non-existent. Only in the central white matter in the region of the ventricles are a few fibres visible with normally stained myelin sheaths. Sections of the cerebrum and cerebellum from the 5-months-old lamb show a degree of myelination more advanced than in the other 5, but still considerably less than normal. In the cerebellar folia a few sheaths have taken the myelin stain lightly. Normal myelin sheaths can be seen in the central white matter, especially in the region of the spino-cerebellar tract, but only in 2 brains is there anything approaching the normal picture and then only in the peduncles. In the mesencephalon there is variable but definite myelination of the oculomotor nerve roots and the rubrospinal tracts. Otherwise only occasional myelinated fibres are visible. Again, sections from the oldest lamb show a greater degree of myelination. Myelination is more advanced in the medulla oblongata, being visible in varying degrees in the trigeminal and spino-cerebellar tracts, the roots of the abducens, acoustic, vagal and hypoglossal nerves and some intersegmental fibres. Myelination of fibres is apparent in all tracts of the spinal cords examined. In the 4-month-old lamb submitted from the second outbreak, only scattered fibres in the dorsal columns are myelinated ; but myelinated fibres are more numerous in the ventral and medial columns. In the 5-months-old lamb, myelination is least at the cervical and thoracic levels. In the other cases the incidence of myelinated fibres in the cord is more uniform, although only some, approximately a third to a half, of the fibres appear to be normal.

Impregnation of sections by Romanes' silver method has revealed no abnormality of the axons which are not only individually normal in appearance, but apparently normal in situation and number. In other words, as far as the axons are concerned the conducting pathways of the central nervous system appear to be fully and normally developed.

Apart from this extensive lack of myelin, the central nervous system appears to be normal. The application of Glee's osmium tetroxide-potassium chlorate method has not demonstrated any active myelin degeneration, nor is there any evidence of oligodendroglial degeneration or acute or chronic inflammatory reaction of any kind in any of the sections.

The only peripheral nerves so far available for study were obtained from the 5-month-old lamb killed at the Weybridge laboratory. Osmium tetroxide preparations from the principal nerve trunks to the

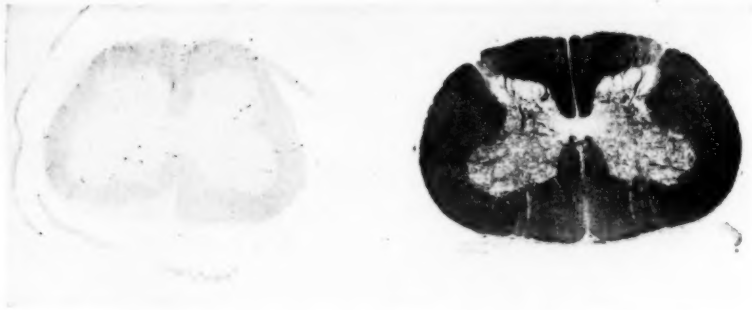

PLATE 1.—Transverse section of severely affected spinal cord on the left. Compare with the normal cord on the right. Loyez's haematoxylin. × 5 (approx.).

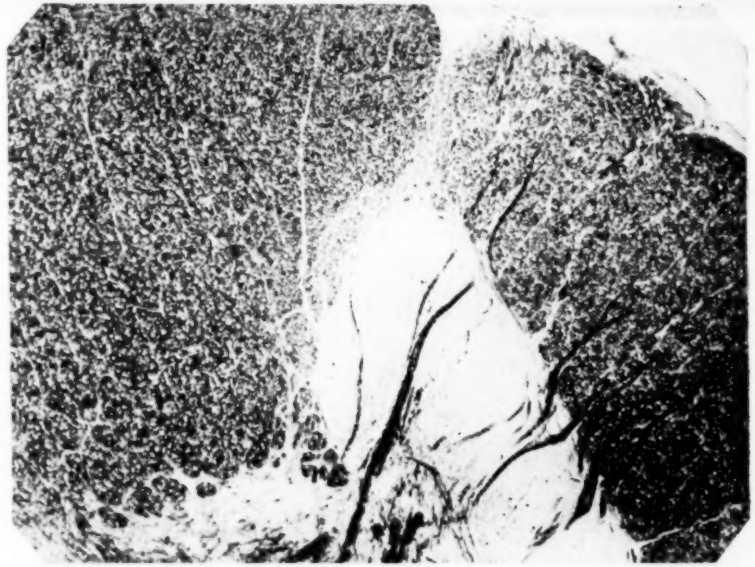

PLATE 2.—Segment of normal spinal cord for comparison with Plate 4. Loyez's haematoxylin. × 38.

PLATE 3.—Despite the severe deficiency of myelin illustrated in Plate 4, the axis cylinders are normally impregnated. Romanes' silver impregnation. × 38.

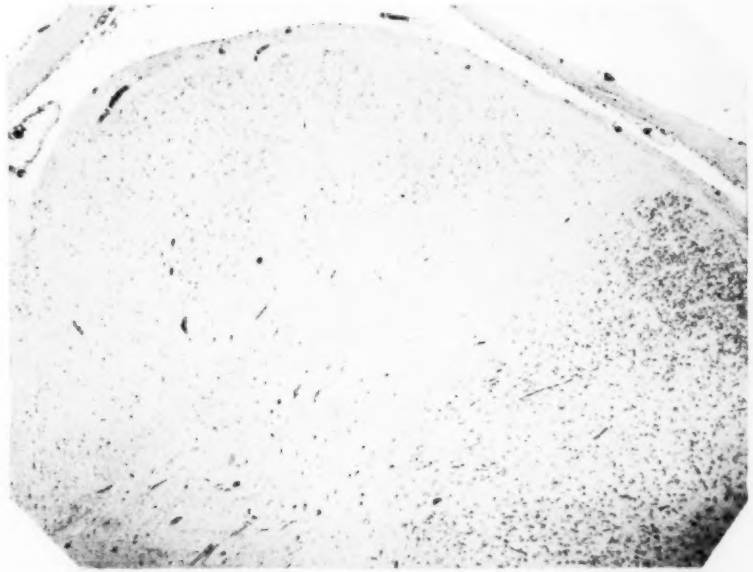

PLATE 4.—Segment of affected spinal cord. Some fibres in the lateral column are apparently myelinated. There is scarcely any myelin in the dorsal column. Loyez's haematoxylin. × 38.

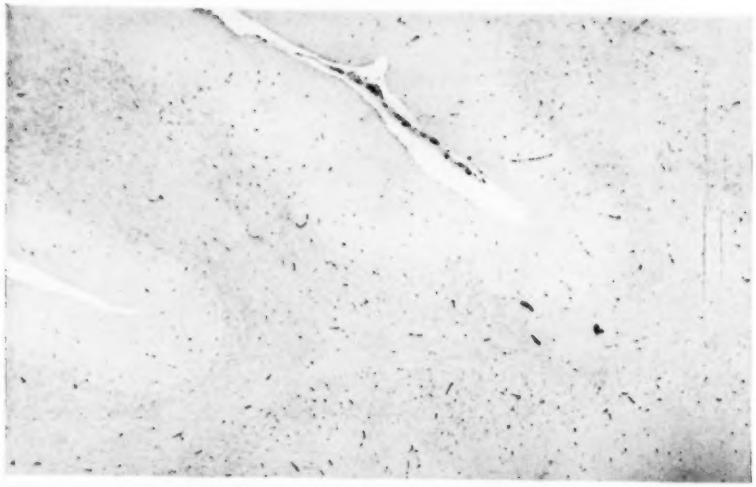

PLATE 5.—Affected cerebellum apparently devoid of myelin. Loyez's haematoxylin. × 50.

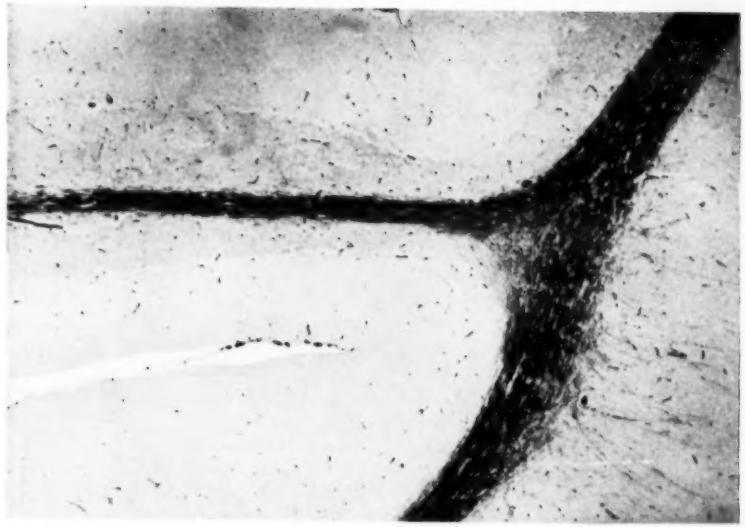

PLATE 6.—Normal cerebellum for comparison with Plate 5. Loyez's haematoxylin. × 50.

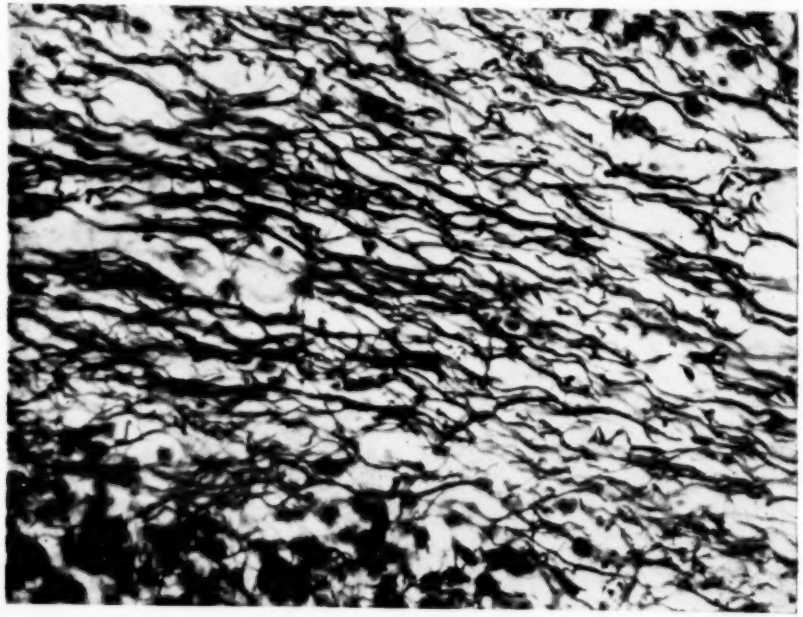

PLATE 7.—The core of a cerebellar folium from an affected lamb showing numerous, normal, intact axis cylinders. Romanes' silver impregnation. × 500.

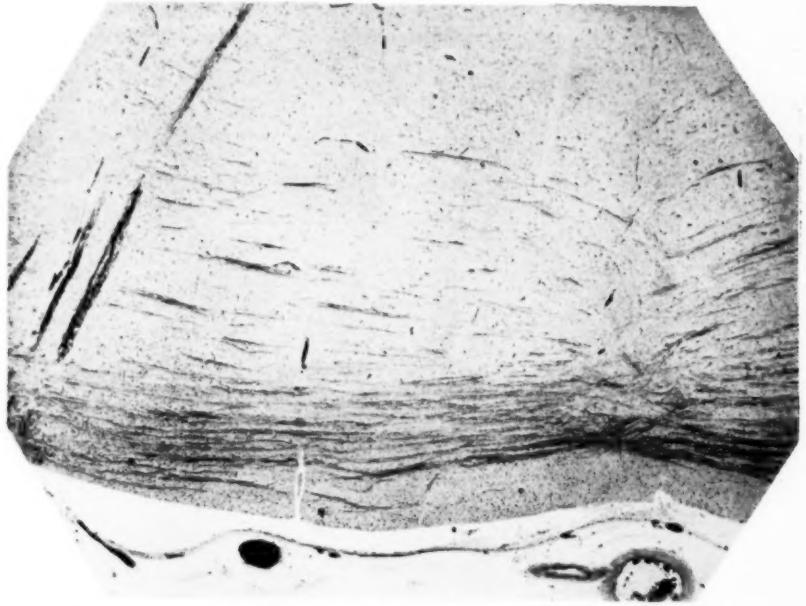

PLATE 8.—From a transverse section of affected pons. Myelination is confined mainly to arcuate fibres and the root of the abducens nerve. Loyez's haematoxylin. × 50.

limb show most of the medullated fibres ringed in black ; but a small number of sheaths can be seen in which no lipid has been demonstrated.

Discussion

Myelin deficiency can be explained by the degeneration and disappearance of originally normal myelin or by defective myelinogenesis. The disease described here is characterised by the normal development and continued integrity of the nerve fibres in association with a bilaterally symmetrical deficiency of demonstrable myelin, considerable or almost total in the cerebrum, mesencephalon and cerebellum, in the absence of any apparent tissue degeneration or reaction. The name *hypomyelinogenesis congenita* is suggested as most appropriately summarising the anatomical basis of the disease and emphasising its congenital nature.

Although swayback has sometimes been attributed to defective myelinogenesis, Barlow (1958) for example, its histopathology contrasts sharply with that described in the present paper ; for in swayback both fibre and myelin sheath are affected, the products of myelin degeneration are readily demonstrated by selective osmium methods and in some cases provoke a microglial response, all of which features testify to the destruction of formed tissue elements. The high liver copper levels found in 3 of our lambs constitute another point of contrast to swayback.

As myelination is normally complete in the ovine foetus at 140 days (Romanes, 1947), the failure of myelination in many normally medullated tracts in our cases could be interpreted as the persistence of an early foetal stage of myelination into post-natal life ; but the pattern of myelination varies in our six cases and in none of them corresponds to any foetal stage of myelination as described by Romanes (*loc. cit.*). There would therefore appear to be a disorder in the pattern of myelination rather than a simple delay in its timing. The clinical improvement seen in survivors could suggest the delayed completion of myelination ; but, as myelination is far from complete in the 2 older lambs examined, it would appear that affected lambs which can feed gradually become adjusted to their hypomyelinate state. The 3 present survivors of the third outbreak may, when they are older, serve to throw some light on this aspect of the problem.

The 3 outbreaks so far encountered have not suggested a solution to the problem of aetiology. The range of breeds affected and the haphazard flock incidence are not strongly indicative of a genetic basis, nor is there anything in the few details of flock management and nutrition known to us to suggest common environmental or nutritional defect.

Acknowledgments.—To the veterinary surgeons who provided the material and some of the clinical information, and to the histology technicians of the Pathology Department at Weybridge, who, under the direction of N. C. Lacey, F.I.M.L.T., prepared the many sections required for this study.

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BARLOW, R. M. (1958). *Proc. Roy. Soc. Med.* **51**, 748.
ROMANES, J. (1947). *J. Anat.* **81**, 1.

PLATE 8.—From a transverse section of affected pons. Myelination is confined mainly to arcuate fibres and the root of the abducens nerve. Loyez's haematoxylin. normal, intact axis cylinders. Romanes' silver impregnation. × 500.

Peritoneal Tympany and Peptic Ulceration in a Cow

BY

M. P. CUNNINGHAM, W. F. H. JARRETT,

AND

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SUMMARY.—A bovine case of pneumoperitoneum caused by peptic ulceration and peritonitis is described.

PEPTIC ulceration of the abomasum is a common lesion in calves and is also found in adult cattle (for a review see Marr & Jarrett, 1955), but few accounts have been given of the clinical aspects of the condition. The present communication records a case in which perforating peptic ulcers were associated with a displaced abomasum and gave rise to a localised chronic peritonitis with adhesions, the latter being responsible for the main symptom of peritoneal tympany.

Subject. An Ayrshire cow, approximately 6 years old.

History. No history of this case was available.

Clinical Findings. The animal was in poor condition, had sunken eyes, and showed marked bilateral symmetrical abdominal distension. Its demeanour was fairly bright, cudding was present, and it ate 12 lb. of hay and 2 lb. of concentrate per day. The faeces were of soft consistency and there was occasional diarrhoea. Stance and walking were normal. The rectal temperature was 102.8° F. and the pulse rate 70 per minute; the pulse was regular in rhythm but the volume was poor. The respiratory rate was 40 per minute with shallow respirations; no adventitious sounds were heard on thoracic auscultation of lungs and heart.

The abdomen was tympanitic on both sides, the sublumbar fossae being distended by gas. Ruminal movements could be heard low down over the left flank but they occurred only once per minute. The cow resented vigorous ballottement but no definite pain centre could be picked up. On ballottement the ruminal contents could be felt but it was impossible to be certain whether the distension was due to ruminal or peritoneal tympany.

A stomach tube was passed into the rumen; no gas or fluid escaped and it was easy to blow down the tube. On rectal examination the rumen could be palpated easily and a gas-filled space was appreciable between the rumen and the abdominal wall. A 4-in. needle was then passed into the peritoneal cavity and there was a marked escape of gas.

Laboratory Findings. The total W.B.C. count was 13,700 per c.mm. and the lymphocyte-polymorph ratio was normal; there was no increase in the percentage of non-lobulated forms. The only abnormality found in examining the body fluids was an albumen/globulin ratio of 0.6 with albumen 3.2 g. per 100 ml. and globulin 5.3 g. per 100 ml.

Differential Diagnosis. On the result of rectal examination the gas was considered to be in the peritoneal cavity and to be arising in an area of subacute or chronic peritonitis infected by gas-forming organisms. The most likely causes of this were thought to be traumatic reticulitis, peptic ulceration, and splenic abscess.

Post-mortem *Examination.* When the abdominal cavity was opened there was an escape of gas under pressure. Examination of the ventral aspects of the stomach revealed that the abomasum was displaced upwards and to the left; the flank muscles on this side were therefore reflected. The rumen showed a patch of organised peritonitis on its upper posterior surface. The abomasum was firmly adherent to the costal part of the abdominal wall by a patch of sclerotic fibrous adhesion measuring 22 by 17 cm. (Fig. 1). This mass contained several small pus-filled tracts and bullae of gas and represented the main focus of inflammation from which the gas in the abdomen was derived.

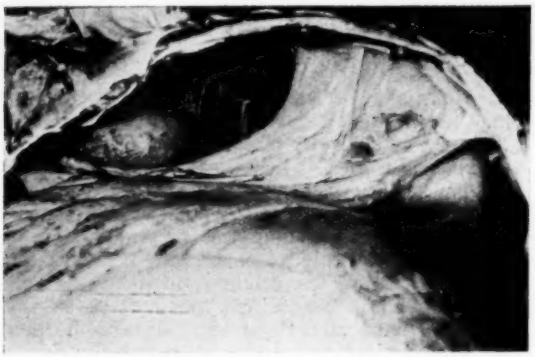

FIG. 1.—Displaced abomasum with fibrous adhesions.

Immediately opposite this adhesion, on the medial aspect, the abomasum was firmly adherent to the ruminal wall over an area of 12 by 10 cm. This adhesion was 2 cm. thick, was extremely firm, and cutting was required to separate the two organs.

The abomasum was opened and the primary lesions in the case were found to be 3 chronic peptic ulcers (Fig. 2). The 2 main sites were on the lateral aspects of the fundus, midway between the omaso-abomasal orifice and the pylorus. The ulcer on the left side (Fig. 3) was 16 cm. long, orientated antero-posteriorly, and 8 cm. wide. It was 2 cm. deep and had rounded, well-formed edges and had completely eroded through the wall of the organ. Its crater was covered with thick fibrin and was formed, and separated from the abdominal cavity, by the thick layer of fibrous adhesion mentioned above.

The ulcer on the right side was similar but smaller, measuring 8 by 5 cm.; it lay over the abomaso-ruminal adhesion. A third ulcer of 0.75 cm. diameter lay slightly posterior to this; this also perforated, the erosion being covered by a patch of granulation tissue.

The localised inflammatory process had spread to involve the parietal surface of the spleen, the latter being firmly adherent to the diaphragmatic peritoneum.

FIG. 2.—Fundus of abomasum with three peptic ulcers.

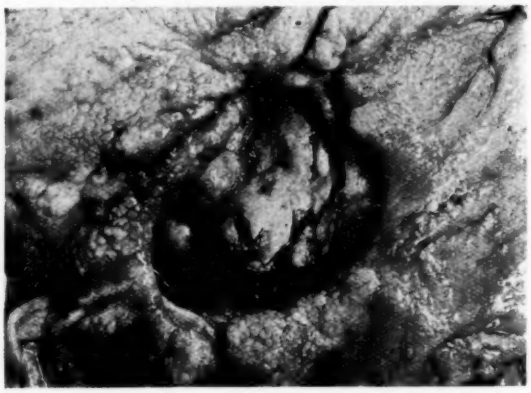

FIG. 3.—Peptic ulcer.

The other organs were normal, the uterus having the appearance of recent pregnancy.

Discussion

There is sometimes controversy about the site of the gas which is causing abdominal tympany in the cow. In the great majority of cases it is the rumen which is distended but occasionally one finds an animal with peritonitis which has given rise to a true pneumoperitoneum. This is probably commonest in acute perforation but the gas can arise, as it did in the present case, in localised foci. Bloat could be excluded in this cow in life both by rectal palpation and by peritoneal puncture.

The relationship between this peptic ulceration and recent pregnancy is interesting since it was also noted in previous cases by Marr and Jarrett (1955) and Pinsent and Ritchie (1955). In the former the main clinical signs were those of a displaced abomasum and the probable mechanism of this visceral derangement was illustrated; the abomasum is normally displaced leftwards in pregnancy; if at this

(*Concluded at foot of col. 1, page 273*)

The Interpretation of Haematological Examinations in Thoroughbred Horses

BY

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Equine Research Station of the Animal Health Trust, Newmarket

SUMMARY.—The interpretation of laboratory haematological examinations of equine blood is described and discussed. A preferred method for the collection of specimens is detailed. Some of the more common haematological deviations from normal are described together with their possible pathological causes.

Introduction

BLOOD is the most important body fluid and is one of the easiest tissues of the body to examine during the life of a patient. Changes in the cellular composition and in the blood plasma are consequent upon many pathological conditions although they are seldom specifically diagnostic. However, much useful information can be derived from a knowledge of the blood picture of horses which are abnormal, and not the least important fact which may emerge in a particular case is that the haematological findings are normal. Normal findings eliminate forms of anaemia, leukaemia, or leukaemoid reactions and almost all forms of bacterial and many forms of viral infections.

While being readily available for biopsy, blood is extremely fragile and changes may take place so quickly as to make subsequent laboratory examination impossible, unreliable, or of much reduced value. The phenomenon of coagulation is one obvious example of the changes which occur after a sample is collected. The leucocytes are particularly subject to distortion after death, so that white cell studies have to be made with very special care.

Preparation of Specimens

(1) *Anticoagulants for Cellular Examinations*

Laboratories accepting blood specimens for examination prepare their own sample bottles, and all tests are based upon a very detailed knowledge of the contents and mode of preparation of those bottles. At the Equine Research Station, we prefer to use the anticoagulant Sequestrene (the di-K salt of ethylene-diamine-tetra-acetic acid) in bijou bottles that have been siliconised (Archer, 1954; Hadley & Weiss, 1955). As the result of some years' experience we are convinced that up to a period of about 48 hours after collection, this substance enables blood samples from horses to be examined for their cell contents with greater accuracy and reliability than any other. Oxalates and citrates are used elsewhere as anticoagulants for this purpose, but such samples can only be examined for leucocytes within about 2 hours from the time of withdrawal (Whitby & Britton, 1957). Postal specimens in these anticoagulants frequently haemolyse and are unacceptable, the leucocytes being grossly distorted and reduced in numbers. Sodium fluoride is used as an anticoagulant for blood sugar examinations only because it inhibits glycolytic enzymes, but is unsuitable for routine haematological use because it produces gross changes in cellular morphology. Heparin is expensive and is not suitable as a routine anticoagulant for laboratory purposes, because it tends to clump leucocytes so that white cell studies are not satisfactory.

(2) *Specimens for Serum Examinations*

Blood samples for serum examinations are best taken into plain, empty (not siliconised) bottles and allowed to clot for at least an hour at room temperature before posting, otherwise haemolysis is liable to occur. It is also very important that needles, syringes, and bottles should be absolutely dry so as to avoid haemolysis and serum dilution. Specimens intended for coagulation investigations require a number of special precautions; the technique used is really a laboratory procedure and not suitable for use in the field.

Taking the Sample

It is necessary to emphasise that the horse from which a blood sample is to be taken should be at rest, and that undue excitement or rough handling must be avoided. The left jugular vein is the most

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Peritoneal Tympany and Peptic Ulceration in a Cow—*Concluded.*

time the ulcer should become active and partially perforate an adhesion could be formed between the left costal wall and the abomasum and this would prevent the return of the organ to this normal position after calving. This same process appeared to have taken place in the present case but the usual signs of displaced abomasum, *e.g.* "tinkling" sounds in the upper left flank, were masked by the pneumoperitoneum.

The pathogenesis of peptic ulceration is not understood in any species but it is noteworthy that in the human female there is usually a regression in ulcer activity during pregnancy and there may be an exacerbation associated with early lactation. It is difficult to explain our case other than on a basis of ulcer activity during gestation since the abomasal displacement could be caused only at that time.

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MARR, A., & JARRETT, W. F. H. (1955). *Vet. Rec.* **67**. 332.
PINSENT, P. J. N., & RITCHIE, H. E. (1955). *Ibid.* **67**. 769.

convenient vein to choose, and a site about mid-way along its course is suitable. A bleeding rope with a bobbin may be required in horses with a thick, fleshy "bull" neck, but for most Thoroughbreds it is unnecessary. For young or very nervous animals, a tiny bleb of local anaesthetic over the vein, introduced subcutaneously by a fine dental needle after swabbing the site with spirit, is extremely useful. The needle used to collect the sample, which need not be more than 22 S.W.G. in conjunction with a syringe, is introduced through the bleb and into the vein, preferably in one firm, controlled movement. It is useful to instruct the groom holding the horse to put his right hand over the horse's left eye so that it does not see the operation or the operator's apparatus.

It is hardly necessary to emphasise that a true venepuncture is essential. In the horse, and particularly the Thoroughbred, the jugular vein is easily found and punctured. At this Station, we prefer to use sterile, paraffined, all-glass syringes for collection of blood samples, but we recommend that field specimens be taken directly from a free-flowing needle in the vein into the specimen bottle, when a needle of larger bore (*e.g.* 18 S.W.G.) is desirable.

It is of the very greatest importance to avoid the presence of any trace of spirit in blood samples for haematological examination, because spirit will rapidly distort the red cells, leading to some haemolysis, and will so change the morphology of the leucocytes that they cannot be identified. If needles are transported in spirit, it is important to allow the first 5 or 10 ml. of blood that emerges after venepuncture to run to waste before collection of the specimen. It is not possible to collect satisfactory blood samples in syringes that are kept in spirit.

For all cellular examinations the volume of blood collected is critical. Bottles are prepared at this Station to be filled to the neck with blood (*i.e.* 5 ml. into a "sequestrenised" bijou bottle). Immediately after collection the bottle must be rolled between the hands for at least one minute to ensure proper mixing of the blood with the dried anticoagulant in the bottom of the bottle. It is best to avoid shaking as this leads to excessive froth formation. It is not far-fetched to regard blood as a fragile living tissue which can be damaged by rough or violent treatment.

Specimens should reach the laboratory with the minimum possible delay. Every hour saved will enable the laboratory to give a better report. If storage is essential before the specimens can be posted (overnight for instance), it is preferable to keep them at 4° C., *e.g.* on the floor of an ordinary domestic refrigerator. The freezing compartment must *not* be used because frozen samples suffer complete cellular disintegration.

Normal Blood Values for the Thoroughbred Horse

Normal values for Thoroughbred blood samples have been given in the U.S.A. by various authors (Hansen *et al.*, 1950a, b, c, d, e, 1951; MacLeod *et al.*, 1947; Todd *et al.*, 1951), and in this country, but not for Thoroughbreds, by Stewart and Holman (1940). Hitherto unpublished figures obtained at this Station for Thoroughbred horses at rest in this country, and especially in the Newmarket area, reveal a haematological picture within relatively narrow limits; the figures are set out in Table I, ignoring differences attributable to age, sex, or state of training. These figures are drastically affected within about 3 minutes if the animal becomes excited or restless when handled (Scheunert & Krzywanek, 1926; Holman, 1947; unpublished results from this Station). In order to interpret haematological reports on samples from clinical cases correctly, it is essential to know the age, sex, breeding, state of training, and whether or not the animal was excited during sampling. Relevant clinical findings and history are needed also in order that the laboratory staff may give the best opinion upon the results it has to present.

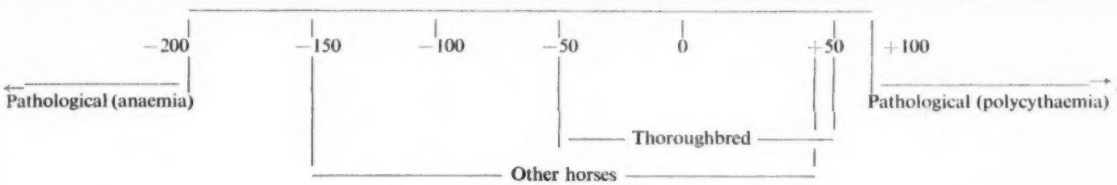
TABLE I
NORMAL BLOOD VALUES FOR THOROUGHBRED HORSES AT REST

Haemoglobin	13·5–19 g./100 ml.
Red cells	7·5–11 × 10^6/c.mm.
Haematocrit	34–50 per cent.
E.S.R.	15–55 mm./hour.
M.C.H.	13–20 γ. γ.
M.C.V.	38–55 cu. γ.
M.C.H.C.	32–38 per cent.
B.I.V.	−50–+50
Leucocytes	5,000–9,000 per c.mm.
Juveniles (J)	0– 20 "
Neutrophils stab or band forms (St)	0– 300 "
Segmented or adult forms (Sg)	2,500–6,000 "
Eosinophils	0– 350 "
Basophils	0– 50 "
Lymphocytes	2,000–4,000 "
Monocytes	0– 500 "

Certain mathematical ratios are used to express details concerning the red cells. M.C.H. (mean corpuscular haemoglobin) indicates the quantity of haemoglobin in each red cell. M.C.V. (mean corpuscular volume) gives the average volume of the red cells. M.C.H.C. (mean corpuscular haemoglobin concentration) is a measure of the concentration per cent. of haemoglobin in erythrocytes. E.S.R. is the erythrocyte sedimentation rate and is a function of red cell size and plasma viscosity.

Some years ago, the Equine Research Station started to include upon its haematological reports the so-called "Blood Index Value" (B.I.V.). This new figure was introduced in order to try to give veterinary surgeons an idea of the red cell status of equine blood at a glance. It is calculated by assuming certain standard values as the normal (*viz.* haemoglobin 15 g. per 100 ml.; R.B.C. 10 × 10^6 per c.mm.; P.C.V. or haematocrit 43 per cent.) and assaying the deviation from each of these, on a weighted percentage basis, of the particular sample examined. The hypothetical normal B.I.V. is zero and deviations from this of more than + or − 50 indicate that there is some red cell abnormality of the specimen. No indication of the type of abnormality can be derived directly from the B.I.V., but it does serve to indicate that a close scrutiny of the

TABLE II
BLOOD INDEX VALUE



Average values assumed: Haemoglobin 15 g. per 100 ml.; Red count ... 10×10^6 per c.mm.; Haematocrit 43 per cent.

other haematological values is necessary. Normal range and deviations of the B.I.V. are given in Table II.

Leucocyte levels in normal Thoroughbred blood are given in Table I as numbers per cubic millimetre. Percentage figures can be very misleading because a high count of, for example, lymphocytes might mask a significant neutrophilia. The immature forms ("juveniles" and "stabs") of neutrophils are normally seen in very limited numbers in blood, since cells which are not fully adult are only released when the demand is abnormally high, *e.g.* in sepsis.

Some of the More Common Abnormalities of Thoroughbred Blood

1. *Red Cells*

Table III sets out the limits of normality and the pathological consequences of increases or decreases in red cell numbers. Increased numbers of circulating erythrocytes are found in haemoconcentration and in polycythaemia. The latter has only been seen on very rare occasions in horses and differs from haemoconcentration in that there is no change in blood volume. On the other hand, haemoconcentration is, by definition, always accompanied by reduced plasma volume so that there is an apparent increase in red cell count. This condition may arise in cases of nephritis, polyuria, purpura haemorrhagica, excessive sweating, sometimes in early fever, and it may be seen in certain other conditions associated with loss of body fluid. Haemoconcentration is not, however, seen in cases of haemorrhage because this always involves a loss of red cells as well as blood plasma.

Profound clinical anaemia of Thoroughbred horses is a relatively rare finding in our experience and, when it occurs, it is usually associated with haemorrhage or extreme cachexia. In these cases treatment by transfusion of whole blood is indicated. Blood volume expanders, of the dextran type, are generally contra-indicated because there is already a shortage of erythrocytes which is made more profound by infusion of plasma or plasma substitutes. These substances may have a place for early treatment of

TABLE III
SOME ERYTHROCYTE CHANGES IN THE THOROUGHBRED HORSES

Erythrocyte count (millions per c.mm.): 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2

	Particulars of cells	Haematological cause	Possible clinical diagnosis
Haemoconcentration ↑	(1) M.C.H., M.C.V. normal. M.C.H.C. may be slightly raised. E.S.R. very low.	Lack of circulating blood plasma.	Nephritis, polyuria, diarrhoea, etc., involving loss of body fluids.
Haemoconcentration ↑	(2) M.C.H., M.C.V., M.C.H.C. normal. E.S.R. normal or somewhat reduced, *i.e.* polycythaemia.	Abnormally high red cell production. Bone marrow hyperplastic.	Very rare in the horse. Aetiology not known.
Normal range ↑	Hb. ... 13·5 — 19 g./100 ml. R.B.C. ... 7·5 — 11 × 10^6/c.mm. P.C.V. ... 34 — 50 per cent.	—	—
Normal range ↓	M.C.H.... 13 — 20 γ. γ. M.C.V.... 38 — 55 cu. γ. M.C.H.C. 32 — 38 per cent.		
Anaemia ↓	(1) M.C.H., M.C.V., M.C.H.C. normal. E.S.R. increased, *i.e.* oligocythaemia.	Bone marrow inhibition of erythropoiesis.	Anaemia of parasitism.
Anaemia ↓	(2) M.C.H., M.C.H.C. low. M.C.V. may be high, *i.e.* hypochromasia.	Lack of iron.	Iron deficiency anaemia.
Anaemia ↓	(3) M.C.H., M.C.V. normal. M.C.H.C. may be low. Marked aniscocytosis. E.S.R. very high. Bilirubinaemia.	Dysfunction of the bone marrow by exhaustion of erythropoietic elements. Haemolysis.	Haemolytic anaemia, including haemolytic disease of the new born.

TABLE IV
INCREASE IN W.B.C. COUNT MAINLY CAUSED BY

Eosinophils	Lymphocytes	Neutrophils		
		"Shift to the left"		Adult
Over about 350 per c.mm.	Over about 5,000 per c.mm.	Adult neutrophils normal. Immature forms over about 1,000 per c.mm.	Adult neutrophils over about 7,000 per c.mm. Immature forms over about 1,000 per c.mm.	Adult neutrophils only over about 7,000 per c.mm.
(1) Parasitism of the gastro-intestinal tract.	(1) Certain cases of tuberculosis, especially if the neutrophil count is *below* about 5,000 per c.mm.	Acute or chronic infections with extensive pus formation causing rapid removal of adult neutrophils from the circulating blood, and stimulation of new neutrophil production by the bone marrow.	Early acute infections of any site.	(1) Chronic infections of any site.
(2) Migrating parasitic larvae with or without adult forms in the bowel giving appreciable faecal egg counts.	(2) The later stages of some virus diseases.			(2) Therapy with some antibiotics.
(3) Allergic reactions.				

collapse associated with gross blood loss, but only if whole blood transfusion with horse blood is not available.

A specific cause of profound anaemia in horses is haemolytic disease of the new-born where there is gross haemolysis of the foal's red cells by erythrolysing maternal antibody. This condition can be treated by exchange transfusion of whole blood, although it would be theoretically better to use washed (*i.e.* plasma free) maternal red cells suspended in compatible plasma from a donor animal. It is clear that equine infectious anaemia, such as is reported from parts of Europe, the U.S.A., and elsewhere, does not occur in Great Britain. With increasingly rapid international air transport of horses it is not possible to know whether this freedom may be maintained, and if so for how long. Pernicious anaemia, strictly speaking, as it occurs in man, has not been reported in horses.

Much more commonly seen is a relatively mild form of anaemia which is normocytic and normochromic in type; *i.e.* oligocythaemia, where the red cells are of normal size and haemoglobin content, but are reduced in numbers. This is frequently associated with parasitic infestation, particularly with the larger strongyle species, so-called "red worms" (Archer & Poynter, 1957), and responds well to anthelmintic treatment and iron therapy. Rather less commonly we find cases of low haemoglobin but with the red cell count approximating to normal (*i.e.* hypochromasia; M.C.H. low; M.C.V. normal or raised). These cases usually respond well to improvement in nutrition and injected iron; there is sometimes a more rapid improvement if vitamin B_{12} is also injected.

2. *White Cells*

Variations in the normal concentrations of the different leucocytes may indicate pathological changes in the patient. Some of the commoner changes, together with likely reasons for them, are set out in Table IV. The neutrophilic or polymorphonuclear leucocytes are most often involved in infectious processes. Where there is extensive acute pus formation, an increase mainly in the number of immature forms takes place (so-called "shift to the left"), but if the infection is chronic, adult forms are more frequent than normal. The distinctions between young and mature neutrophils are often difficult or impossible to detect in samples badly taken, or in those in unsuitable anticoagulants, and in such samples much valuable information is lost and time is wasted.

Lymphocytosis sometimes occurs in tubercular infections after the initial acute phase, and in some viral diseases if there is no secondary bacterial infection, but is very rarely seen in any other conditions. However, it must be emphasised that the absence of lymphocytosis by no means excludes the possibility of tuberculosis.

Eosinophilia is classically associated with parasitism of the gastro-intestinal tract, but, because eosinophils spend only a very brief part of their life in circulating blood (about 4 hours) (Archer, 1956; Dustin and de Harven, 1954), failure to demonstrate eosinophilia in a single blood sample even in severely parasitised animals is not uncommon. These cells rapidly disappear from the circulating blood following shock, etc., and so may not be found in any particular specimen although present in enormous numbers at the site of infestation or where much tissue damage has occurred. Migrating larvae will cause eosinophilia of blood without, of course, any evidence of infestation being obtained from examination of the faeces by worm egg count methods. Certain kinds of allergic reactions will also cause eosinophilia, but this is a rare finding in the horse.

A general leucocytosis frequently follows within about 24 hours of commencing antibiotic therapy. It is, therefore, most important to know if antibiotics have been previously used for treatment, when an interpretation is to be made of a haematological sample.

The authors have not seen a case of leukaemia in the horse in spite of careful search for some years. The disease is evidently rare although it has been reported. Diagnosis based upon examining a blood sample is unlikely to present any great problem in such a case. The Equine Research Station would be particularly glad to be able to examine any cases of proven or suspected leukaemia in horses and would much appreciate any help in this respect.

3. *Special Examinations*

Special examinations are sometimes necessary, especially in cases where such abnormalities as petechial haemorrhages are seen. The blood platelet count may fall to low levels in certain disorders of the coagulation system of the blood, in some instances of prolonged high fever, and in chronic wasting diseases. Vital staining of a sample to determine whether or not reticulocytes are present in a recovering or convalescent horse can provide valuable information since the presence of reticulocytes in horse blood is always abnormal. Examinations of bone marrow fluid are often of great value in deciding upon specific forms of therapy or in checking the magnitude of the response of the haemopoetic tissues during recovery. Studies of the full coagulogram of horses are relatively new (Barkhan *et al.*, 1957; Bell *et al.*, 1955; Fantl & Marr, 1958), and it is too soon to be able to indicate the clinical significance of deviations from the normal findings.

For many of these examinations, specimens must be taken direct from the horse into the laboratory, because changes may occur in minutes only. Such examinations are therefore limited to patients in a hospital with laboratory facilities immediately available.

Many other valuable examinations, *e.g.* of serum proteins, serum inorganic contents, serum enzymes, and both bacterial and viral serological examinations, are not considered in this article since they merit special consideration separately when the basic information is upon a more firm basis.

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The Role of the Veterinarian in Livestock Development*

BY

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Introduction

WHEN the title of this paper was suggested to me by those responsible for the organisation of the Caribbean Convention, I decided to dispense with the stereotyped approach to this most important subject and to describe to you what—in the absence of evidence to the contrary—I believe to be the most successful and ambitious scheme of dairy herd improvement which has ever taken place. It has been developed over the last 20 years, and the fact that it has passed almost unnoticed in the literature is probably due to a variety of reasons which include the long-term nature of the project, the acknowledged difficulty of assessing improved genetic merit, and the stress of the war and post-war conditions in which it was initiated and carried to fruition. It grew from a comparatively simple conception to become a most significant feature of agricultural development in Great Britain. The United Kingdom has always claimed to be the stock market of the world, and has always had an enviable reputation for the quality of its pedigree herds of both dairy and beef cattle. The standard of these pedigree herds to-day is higher than ever, and interest in livestock improvement generally has never been greater nor on surer foundations than in this age of greater understanding of constructive breeding.

Yet, in the years immediately preceding the war, there was considerable concern among those who had watched the effects of the inter-war neglect of agriculture and the quality of the stock in the average commercial dairy herd: indiscriminate cross-breeding, using bulls of which little or nothing was known (often without pedigree or production records of milk or butterfat) was commonly practised. The emergency of the war and the need for British agriculture to maintain supplies of liquid milk for the home population, with a vast reduction in imported feeding-stuffs and a considerable reduction in the acreage under grass brought about by the "ploughing up" policy to grow bread corn, resulted in a pro-

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gramme aimed at self-sufficiency on the farm with the increased production of that first priority—milk.

The Foundations of Dairy Herd Improvement

The foundation of the extraordinary advance made in livestock improvement throughout the length and breadth of the country was the declared policy of the then Minister of Agriculture, the late Mr. Robert Hudson—afterwards Lord Hudson, that farmers should breed their dairy stock to breed type. Under war conditions farmers worked under the benevolent yet firm direction of the Ministry in respect of cropping and production generally. They had available to them agricultural scientists in all branches on the staff of the County Agricultural Committees veterinary surgeons of the Animal Health Division and in practice, and, in addition, hand-picked progressive farmer-members of the agricultural committees who inspected farms where production was low in company with the appropriate advisers.

The bull licensing regulations were changed and virtually closed the door to the scrub bull, attention being paid to production records of milk and butterfat as well as to inspection for conformation. The farmer himself decided on the breed he wished to establish. Propaganda drew the rosy picture of 4 generations resulting in the 97½ pure-bred animal eligible for pedigree registration—and so livestock improvement, on a nation-wide scale, started in my lifetime.

This was a vast contra-distinction to the livestock improvement resulting in the indigenous breeds of Great Britain which arose from selection within small communities to establish breed types which had particular qualities of merit, and which now exist in far greater numbers in countries overseas than in Great Britain.

Once breeding to type was adopted, the importance of the survival of the progeny—indeed the importance of it being a heifer—was reflected in the higher standard of care of both the dam and the calf. A lost heifer calf meant a lost generation.

Thus was born the pride of possession of improved stock bred to breed type, and the revolution in animal husbandry which resulted not only in the maintenance of liquid milk production under war and post-war conditions but also in its continual increase, until to-day the liquid market is saturated.

Increase in Milk Production

Breeding to breed type made it possible for the farmer to concentrate on the specialised dairy breeds as opposed to the dual purpose breeds. Before the war these comprised 15 per cent. of the total—to-day they comprise more than 60 per cent. It is estimated that more than 25 per cent. of the increased milk production is due to this factor alone. In order to encourage the farmer to breed his dairy herd replacements, subsidies for heifer calves, inspected and approved at 6 months of age, were paid by the Government, the amount varying between £4 and £5. The figures for annual milk production in millions from 1937/38 to 1956/57 give a clear indication of the improvement achieved :—

1937/38	1,063	1947/48	1,321
1938/39	1,119	1948/49	1,459
1939/40	1,071	1949/50	1,586
1940/41	1,045	1950/51	1,525
1941/42	1,079	1951/52	1,530
1942/43	1,145	1952/53	1,601
1943/44	1,180	1953/54	1,678
1944/45	1,204	1954/55	1,639
1945/46	1,259	1955/56	1,746
1946/47	1,243	1956/57	1,859*

* Provisional.

Milk production was held in the early war years in spite of a vast reduction in imported foods and a temporary small reduction in numbers. In 1953/54 and 1956/57 there were increases of 68,000 and 98,000 in the national dairy herd whereas in the other years between 1952 and 1957 there were small declines in numbers. Over the 5-year period it is estimated that of the 270 million gallons increase in milk output, about 70 million gallons were due to greater numbers and 200 million gallons to higher yield per cow.

In 1939 the 6 main dairy breed societies—Ayrshire, Friesian, Guernsey, Jersey, Red Poll and Shorthorn—had fewer than 10,000 members out of approximately 160,000 registered milk producers. In 1943, the year artificial insemination commenced (but significantly 4 years after breeding to breed type became national policy), there were 13,200 herds, comprising 81,111 females and 16,063 males : by 1953 the number had risen to 38,000—201,336 females and 16,112 males. The number has continued to increase and now comprises about 45,000 herds, totalling more than 300,000 animals.

In addition, there is a vast reservoir of grade cattle which have been bred in the main from superior artificial insemination bulls, and these total 2½ to 6 times the number of pedigree cattle, depending on the breed.

It would be true to say that there are those who belittle the effects of genetic improvement and attribute the main effect to improved management and methods. The absence of adequate statistical evidence gives room for argument but none can deny the pleasing spectacle, seen throughout the country, of herds bred to breed type; of farmers generally interested in discussing and practising herd improvement; of culling low producers or other unsatisfactory animals; and of a vast increase in up-graded and pedigree herds which is reflected in breed society records and memberships.

The Rôle of the Veterinary Surgeon

What is the part played by the veterinary surgeon in all this ? In Great Britain he probably has more frequent contact with the farm and the farmer during the course of the year than any other adviser, and he is present at a time when anxiety for the health of the individual animal or the herd makes the farmer more receptive to advice. As an adviser during the early years he was an excellent ambassador for the declared agricultural policy. The enhanced value of stock, together with a guaranteed market for the expanding production, resulted in a great improve-

ment in animal husbandry, and led to an increasing demand for veterinary advice and services.

War-time schemes for disease control—such as that worked on a capitation fee basis for the control of contagious abortion, mastitis, infertility and Johne's disease—which resulted from the joint discussions of the National Farmers' Union, the Animal Health Division and the British Veterinary Association, highlighted the farmers' and the Government's realisation of the value of veterinary science in the efforts to bring about improvement in the herds and in production generally. It was perhaps fortunate that Strain 19 vaccine, introduced from America, and the sulphonamides for the treatment of *agalactiae* mastitis became available at that time, and gave us some of the tools with which to work more efficiently than previously. Trichomoniasis was rife in those areas in which communal bulls were used. It was a powerful adjunct to arguments in favour of bulls of high pedigree with known records of milk and butterfat being used for artificial insemination, particularly in smaller herds. The disease is a rare entity to-day, and has virtually been eliminated by the widespread use of artificial insemination.

The Milk Marketing Board—a producers' organisation for the marketing of all the milk produced in the country, which rescued the pre-war dairying industry from economic oblivion—gradually established a nation-wide series of A.I. centres and, together with a small number of independently organised centres such as the Hampshire Cattle Breeders, Cambridge and Dartington Hall, eventually covered the whole country. Boundaries were agreed in a spirit of co-operation, and there has been throughout a mutual exchange of information both technical and administrative. To-day no less than 1,750,000 out of less than 3,000,000 animals to be served are inseminated. The regulations introduced by the Government in respect of artificial insemination require all bull centres to be under the effective control of a veterinary surgeon, to ensure the health of the bulls and their freedom from disease communicable by artificial insemination.

Grassland Improvement and Intensive Husbandry

The " ploughing up " policy introduced during the war saw the introduction of a system of alternate husbandry and a vast programme of grassland improvement. This resulted in far greater production per acre of more highly productive leafier types of grasses and clovers with greater recuperative qualities which in turn resulted in longer periods of grazing or greater concentration of stock on smaller acreages of pasture and more frequent return to the same pasture. The average of 15 weeks productive grazing of pre-war agriculture was rapidly extended to 30 or more weeks, and production continued to soar.

The amount of purchased concentrate (Milk Marketing Board, England and Wales) in 1938 to 1939 averaged 3.89 lb. per gallon of milk produced, falling to 1.65 lb. in 1942 to 1943, and rising after the war when imports became easier, to 2.2 lb. in 1949 and 1950. Following release from controls in 1953, Milk Costs Investigations show that while the average usage in 1939 was 23 cwt. per cow, it was less than half this figure in the late '40's and following derationing in 1953 rose to 18 cwt. This in spite of an increase in average milk yield from 500 gallons pre-war to 720 gallons now.

Grassland improvement brought with it the problems of a changed environment. The idea that ploughing up and growing new pasture would do much to get rid of diseases was rapidly dispelled. Metabolic diseases, parasitism, allergies and photosensitisations, deficiency diseases, breeding associated with nutritional problems, anoestrus in heifers intended for breeding in the winter months or in freshly-calved cows which fail to come into season in time for service to calve again within 12 months, fertility problems of low phosphorus intake or of manganese fixation, these were soon everyday problems of veterinary practice.

The rapid adoption of machine milking at a time of acute labour shortage resulted in an increased contagious mastitis problem. It was preponderantly *agalactiae* infection in those days and fortunately was very efficiently dealt with by penicillin when it became available for use.

New Methods of Disease Control

The profession organised itself, through the British Veterinary Association, to collate and disseminate new knowledge and experience available in booklet form and articles. There was close liaison with the Government veterinary services of the Animal Health Division. Since most veterinary surgeons in practice were part-time veterinary inspectors of the Ministry of Agriculture, every encouragement was given to constructive efforts to promote animal health and production. Liaison of veterinary surgeons with agricultural scientists in all spheres was rapidly developed and, as confidence grew, it became a feature of agricultural progress in Great Britain. Research into animal disease problems has been greatly enhanced and the Veterinary Schools themselves play a prominent part in the work. The farmer is kept well informed through the National Farmers' Union and its branch meetings, and the rising generation is well provided for in the Young Farmers' Clubs organisations.

Contagious abortion is under effective control by calfhood and adult vaccination, using Strain 19. Vibriosis which was the cause of great concern—particularly in view of its possible transmission by A.I.—has now been found to be diagnosable by test-mating and amenable to prophylactic and curative treatment.

We are fortunate in Great Britain in that the major epidemic diseases of the world do not plague us. Foot-and-mouth disease, when it does occur, is kept under rigid control by eradication by slaughter of the whole of the infected herd or herds; this retains the normal freedom of the country from that dread disease and permits the export of stock to other countries in the world without risk to them of foot-and-mouth disease.

The vastly improved health status of the herds of the country—which by 1961 will see the completion of the scheme for eradication of bovine tuberculosis—has resulted in the productive life of the dairy cow

being more than double what it was before the war; production in the national herd has risen from 500 gallons to more than 720, and this is still growing. In recorded herds it has increased from 7,040 in 1946/47 to 8,783 in 1956/57. The number of recorded herds has increased from 17,758 to 23,303 involving more than 700,000 cows. The increased potential for milk production in the older cows now found in the herds, and the greater opportunities for selection and culling now afforded, must lead to still greater improvement.

Present-day Changes in Agricultural Policy

The saturation of the liquid milk market has led to a change of policy from maximum production to one of maintenance of overall production at lower cost per gallon. This implies further herd improvement by proper selection.

The increased longevity of our dairy cattle has resulted in a reduction in the number of replacements needed for the dairy herds. This, in turn, has been reflected in a switch to beef production from dairy herds of all types, by crossing selected animals—usually the lower producers and heifers—with beef bulls by A.I. This has spoiled the uniform look of our herds but is a policy dictated by economic factors; at the present time 25 to 30 per cent. of all inseminations in dairy herds are by beef bulls. The potential for beef production from dairy herds is great indeed and provides the farmer with an alternative profitable enterprise. A new programme is awaiting development—the organisation of the marketing of the beef stock so bred, often in very small numbers by individual farmers, at ages to suit the policy of both breeder and purchaser.

During this vast programme of dairy herd improvement there has been an extraordinary expansion in both the pig and poultry industries in Great Britain. Both lend themselves to greater intensivism which has been fully exploited in poultry, particularly through battery, deep litter and straw yard methods of management and in broiler production.

The tendency has been for a marked increase in flock size to occur. The poultry population has increased from 23 million adult birds in 1940 to approximately 35 million in 1956. The broiler industry—virtually non-existent in 1950—has now reached 55 million and is expected to reach 100 million in 1960. The present population of turkeys is 2,800,000, an increase of 100 per cent. in 3 years. At the present rate of consumption Britain is 90 per cent. self-supporting in eggs.

An industry rapidly increasing in size under extreme and quite artificial methods of husbandry must meet very high disease and vice hazards. Coccidiostats, antibiotics and other chemotherapeutics are now creating their own problems. The place of the veterinary surgeon is obvious and is well established in Great Britain where he is an integral part of this great industry.

During the war the pig population fell from about 3½ million to less than 1 million owing to the shortage of feeding-stuffs for pigs which was due to the concentration on milk production. There was a slow rise after the war when imported feeding-stuffs became more plentiful and after derationing in 1953 there was a vast increase in numbers to over 5½ million. Such development necessarily brought health risks which came within the province of the State and the private veterinary service, but these have been dealt with adequately.

More recently, progeny testing stations on the Danish principle have been established, and there is a Pig Industry Development Association which has a strong Veterinary Committee—indicative of the importance placed on veterinary science in livestock development.

Artificial insemination in pigs is being exploited, and in the case of the Hampshire Cattle Breeders' Society a conception rate of between 45 and 50 per cent. is now regularly achieved by Madden and his staff, and he has great hope of further improvement. Full exploitation of progeny-tested boars through artificial insemination is a great hope for the future.

Conclusion

Veterinary science made a vast and, in fact, a key contribution to the problems of expanding production under the conditions induced by a war-time and post-war economy in Great Britain. The indications are that without that contribution failure would have resulted. Genetic improvement, improved husbandry and disease control have all been inter-dependent. The profound effects of innovations in husbandry sometimes resulted in stresses being manifested which were not expected and which, in consequence, frequently occurred as problems of some magnitude. Experience indicates the need for careful consideration of possible repercussions of changes in methods and management on health and production, particularly in countries where there is considerable diversity of environmental conditions.

My conclusions are that:—

1. Herd improvement can only proceed successfully on a national scale under conditions of assured marketing for farmers which must show an adequate return for their expanding production;
2. Under conditions of emergency or of a rising standard of living the demand for animal products increases. Social service schemes, such as milk in schools (one-third of a pint daily) or subsidised milk for expectant mothers and babies, all contribute to developing not only an appreciation of its nutritive value but a liking for it as a beverage or food. It must be safe, and this is essentially a responsibility of the veterinary profession. It is interesting to realise that the average consumption in England is still too low at 5½ pints per week and that 31 per cent. of this goes into tea—an indication of a national habit;
3. The initial policy of herd improvement must be simple in conception and appeal to the farmer. He must have some freedom of choice of the type of stock he will breed and own;
4. There must be a simultaneous policy of improved animal husbandry, which is the first step in preventive veterinary medicine, together with a planned policy of disease control and eradication in the light of the veterinary information and experience available.

The maintenance of health and disease control becomes an essential requirement of herd improvement and therein lies the sphere of veterinary preventive medicine and the rôle of the veterinary surgeon.

5. Livestock improvement is complementary to improvement in farming methods generally. Balance tends to be automatic in agriculture;

6. There is a tendency to establish a limit of productivity for a certain set of environmental conditions, which include economical as well as husbandry and nutritional factors;

7. Governments can expedite livestock improvement by subsidising more economic production by grassland improvement schemes and desirable herd improvement on a calf capitation basis. Similarly, they can provide incentives to eradicate disease;

8. Superior sires available must be exploited through artificial insemination;

9. There must be a careful system of assessment of the genetic value of the bulls used and a careful check on the possible introduction of heritable defects.

It is probable that the relative breeding value method of assessment of superiority combined with the inspection of progeny might well be the most practical means available at the present time. This is a system of comparison with contemporaries which gives an estimate of how much a bull is transmitting above or below the breed average.

The veterinary surgeon will undoubtedly play a major practical part in the relatively new field of breeding involving the artificial transference of tissue from the superior dam to host animals which, whilst of inferior genetic merit, are capable of dealing with the gestational requirements. Two main lines of research are involved at the present time on both sides of the Atlantic :—

1. *Ovum Transfer.*—Hormonally produced superovulation of a superior dam, followed by insemination from a superior sire of choice, the flushing of the morulae from the oviducts and their subsequent storage and arrest in growth until recipients are available in the correct stages of oestrus for acting as hosts to the developing foetus. In this way the number of offspring from a superior dam may be increased during her remaining life span, or even thereafter, should the freezing of fertilised ova become a reality.

2. *Ovarian Tissue Transplantation.*—Here the actual ovarian tissue of the superior dam is excised, stored and then grafted into the ovarian stroma of recipient animals whose own germ cells have been destroyed (by irradiation) so that the recipients thereafter ovulate the eggs of the superior dam thus increasing the possible number of offspring. The difficulties of tissue tolerance have to be overcome.

Surgical interference thus plays a major part in these dramatic new techniques.

Improvement and development of livestock needs definition in relation to given environments. Any schemes for betterment are doomed to failure without prior identification of the handicapping disease conditions; particular emphasis should be placed on nutritional diseases, their eradication, prevention or control, with careful supervision subsequently to guard against recrudescence of the old diseases or introduction of new ones.

Where progress has been made, any scheme operated without full attention to the subclinical, non-dramatic, but often very handicapping conditions responsible, will not be successful. These conditions include irregularities in reproduction, absence or deficiency of specific essential elements (*e.g.* minerals, vitamins), parasites (ecto- or endo-parasites) even low grade parasitism, and a whole host of local environmental handicaps concerned with temperature, altitude, water supplies, etc. The recognition of the routines necessary for their control or eradication and the initiation of research where needed to identify causes is essential. The collation of information from scientific sources throughout the world, particularly from countries with similar problems, is an essential feature of progress to-day.

Livestock development proceeds fastest when tackled by a team of agriculturists, veterinary and agricultural scientists, and marketing experts. It would, however, be right to emphasise the indispensable part played by the veterinary surgeon; this has been demonstrated in many countries of the world and more particularly in Great Britain, South and East Africa, Australia and New Zealand. Specific examples of the rôle of the veterinary surgeon are as follows :—

In reproduction—the control of infertility and breeding diseases, greater efficiency of breeding through A.I., pregnancy diagnosis, control of oestrus and recognition of heritable defects.

In rearing—the avoidance of preventable losses and the securing of better and quicker development, together with selection of future breeding stock on a positive health basis.

In adulthood—to effect recognition and control of environmental factors and stresses induced by management and methods designed to bring about maximum production and increased productive life through maintenance of a high standard of health.

The general planning of policies for small, medium and large holdings is essential. Disease control impacts; quarantine and isolation measures and control of movements of stock must be planned efficiently.

The education of owners in new veterinary knowledge by demonstrations, talks and disease control schemes is a feature of modern veterinary practice.

The importance of the State Veterinary Service with its responsibilities for the maintenance of health of the stock of the country, the control and eradication of disease problems concerned, and the avoidance of the introduction of exotic diseases, is well recognised. Such a service must play a leading and co-ordinating part in any livestock improvement programme if it is to succeed.

References

GOULD, G. N. (1958). *Journal of the Farmers' Club.* Part 2.
EDWARDS, DR. J. (1955). *Ibid.* Part 5.
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The Second B.S.A.V.A. Congress

Following the great success of the first congress of The British Small Animal Veterinary Association the organising committee selected a rather more ambitious hotel for the second annual congress this year. The wisdom of their choice was amply proved by the fact that over 300 people registered this year compared with approximately 230 last year, and a far higher percentage stayed in the congress hotel, despite the increased cost.

The scientific programme was adapted so that only one paper was being read at a time, and this meant that only one congress meeting room was used. In addition the programme was so arranged to make full use of the Sunday, and the most important section, a discussion on "Virus and Allied Diseases of the Dog" was placed at the end of the Sunday afternoon session. The fact that this was attended by the largest number of delegates pointed to the fact that this arrangement was a sound one. It is not proposed to discuss the large number of papers presented as these will ultimately be published separately, but in addition to the Sunday afternoon paper referred to, another session of great interest to members was the Saturday afternoon section dealing with unusual patients. Papers were read by authorities on these special subjects and the information given will be of great help to small-animal practitioners in dealing with the growing numbers of pets other than dogs, cats, and budgerigars.

Probably the highlight of the congress was the annual banquet and ball held in the Washington Hotel on the Saturday evening. The President of the Association, Mr. C. E. Woodrow, and his wife, received a number of guests including Mr. and Mrs. G. N. Gould and Mr. and Mrs. W. G. R. Oates representing the Royal College, and Mr. and Mrs. Ingram and Mr. and Mrs. Oliver from the B.V.A. Speeches were limited to two of two minutes each. Mr. Woodrow, in welcoming his guests, said that his position at the top table reminded him of the great bed of Ware which was constructed to hold an entire family of twelve. The B.S.A.V.A., represented by himself, was the lusty infant situated between the father and mother of the R.C.V.S., and the B.V.A. The normal rule in these situations is to turn when father says turn. Mr. Woodrow suggested that, perhaps, the infant had been rather slow to do this in the past; however, he was sure that despite this the family ended up all facing the same way.

Despite their late night members rose early to support the Sunday morning session which started with a report on the fee survey carried out by the Association. This promises to pave the way for a recommended scale of fees for small-animal practice.

This session was followed by the annual general meeting when Mr. C. E. Woodrow retired from the chair, and the appointment of Mr. S. F. J. Hodgman as his successor was carried with acclamation. Mr. Woodrow was appointed senior vice-president and Mr. Brian Singleton while retaining his post as secretary was appointed junior vice-president. Mr. Hodgman's post as treasurer was filled by Mr. J. S. J. Lauder, and a new post of assistant secretary was filled by Mr. A. P. Phillips.

In taking over the chair, Mr. Hodgman made a short speech of thanks to Mr. Woodrow for steering the Association so ably from its inception until it had reached full strength and success. He felt sure that Mr. Woodrow would in future look back with pride as being responsible for the development of the Association, and on behalf of the members he presented him with a ship's barometer and a ship's clock referring to Mr. Woodrow's hobby of "messing about in boats." In accepting these gifts Mr. Woodrow remarked that the barometer was "set fair" and this he felt was a good omen for the future of the Association.

This report would be incomplete without referring to the support the Association received from the trade exhibitors. This exhibition was attended by 25 firms, and every exhibitor appeared to be well-pleased with the support given by members of the Association. In addition to the trade exhibition a small scientific exhibition was also mounted in the main congress room and this evoked a great deal of interest among the delegates.

There is no doubt that the annual congress of the B.S.A.V.A. is now established as an important event in the veterinary calendar, and visitors supported the committee's action in selecting a leading hotel as a regular venue for this event. Plans are already being made for the third annual congress in 1960.

G. N. H.

UNIVERSITY OF LONDON SPECIAL LECTURES

A course of three lectures on "Fungous Diseases of Animals," by Dr. G. C. Ainsworth of the Commonwealth Mycological Institute, Kew, will be given at the Royal Veterinary College, Royal College Street, Camden Town, N.W.1, at 5 p.m., on May 11th, 12th, and 14th, 1959. The syllabus will include: Lecture I, The Fungus; Lecture II, The Fungus and the Host; Lecture III, The Fungus, the Host, and the Environment. At the first lecture the Chair will be taken by Professor T. J. Bosworth.

A lecture on "Recent Advances in the Study and Control of Animal Virus Diseases," by Dr. I. A. Galloway, Director, Animal Virus Diseases Research Institute, Pirbright, will be delivered at Wye College (The Swanley Hall, Withersdane), Nr. Ashford, Kent, at 8.15 p.m. on Thursday, April 30th, 1959. The Chair will be taken by Mr. Dunstan Skilbeck, C.B.E., M.A., Principal of Wye College. The Lectures are addressed to students of the University and to others interested in the subjects, and admission is free, without ticket.

News and Comment

REVOCATION OF THE MEAT (STAINING AND STERILISATION) REGULATIONS, 1959

The above-named regulations as set out in THE VETERINARY RECORD of January 17th will not now come into force on April 1st as was originally intended. As announced in the House of Commons on February 26th, the Minister of Agriculture, Fisheries and Food and the Minister of Health have decided that the requirements about the staining or sterilisation of unfit meat need further consideration before they become law.

In order to allow time for further consultation with representatives of the various interests concerned they have, therefore, revoked the regulations by means of the Meat (Staining and Sterilisation) (Revocation) Regulations, 1959, which were made on March 19th.

OPENING OF THE WELLCOME RESEARCH LABORATORY (EAST AFRICA)

On January 30th, 1959, the Wellcome Research Laboratory (East Africa) was declared open by the Minister of Agriculture for Kenya, the Hon. Michael Blundell, M.B.E. Mr. M. W. Perrin, C.B.E., the Chairman of the Wellcome Foundation Limited, Dr. D. W. Adamson, the Research Director, and Dr. R. F. Montgomerie, the Director of Veterinary Research, had travelled from Britain for the opening ceremony.

The Head of the Laboratory, Mr. J. K. H. Wilde, M.SC., B.SC., M.R.C.V.S., A.R.C.S., introduced Dr. Adamson, who outlined the primary function of the laboratory and the extending interest which the Wellcome Foundation is showing in the field of veterinary research. He called on Mr. Blundell to perform the opening ceremony.

In a characteristically vigorous speech, Mr. Blundell paid tribute to the interest which the Wellcome Foundation had shown in the control of animal diseases in Kenya. He emphasised that the new laboratory would be complementary to the research sections of the East African High Commission and of the Government Department of Veterinary Services, and that its team of workers would greatly strengthen the veterinary research effort in East Africa. He welcomed the fact that the Wellcome Laboratory had selected as its first project the study of chemotherapeutic measures to control east coast fever, one of the diseases of major economic importance in East Africa and in the Central African Federation. Mr. Blundell also referred to the generosity of the Wellcome Trust in providing the sum of £100,000 to enable the government of Kenya to provide a foot-and-mouth disease research laboratory in the colony and briefly described the progress which the government had made towards its establishment.

Dr. Montgomerie expressed to the Minister the thanks of the Foundation for his having formally opened the laboratory and presented him with a silver cigarette box as a memento of the occasion.

The distinguished company which assembled for the opening ceremony included the Speaker of the Legislative Council, The Hon. Sir Ferdinand Cavendish-Bentinck, K.B.E., C.M.G., M.C., whose encouragement of veterinary research in the colony during his long period of service in various capacities had earned for him the respect and thanks of the veterinary profession. He was supported by a number of his parliamentary colleagues, by representatives of the East African High Commission, by prominent members of the medical profession in Kenya, and by a large number of veterinary research workers in the East African territories. The guests later toured the laboratory and many commented very favourably on the design and lay-out of the laboratory buildings, and the fact that they had been completed within twelve months of the occupation of the site.

The Wellcome Research Laboratory (East Africa) is situated near Nairobi on an estate of about 130 acres adjacent to the government research laboratory at Kabete and within about 12 miles of the East African Research Organisation laboratories at Muguga. It is a nucleus laboratory designed to provide the opportunity for research in the chemotherapy of animal diseases of tropical and subtropical countries.

Mr. Michael Blundell (Minister of Agriculture for Kenya) speaks at the opening of the Wellcome Research Laboratory (East Africa). Also to be seen are (left to right): Mr. J. K. H. Wilde (Head of the Laboratory), Dr. R. F. Montgomerie (Director of Veterinary Research, The Wellcome Foundation Ltd.), Mr. M. W. Perrin (Chairman of The Wellcome Foundation Ltd.), Sir Ferdinand Cavendish-Bentinck (Speaker of the Legislative Council, Kenya), and Dr. D. W. Adamson (Research Director, The Wellcome Foundation Ltd.).

DR. TOM HARE, Ch.B., B.V.Sc., M.R.C.V.S.

Mr. A. B. Orr writes:—

"Dr. Tom Hare is probably best known for his work on β-haemolytic streptococcus infections but it is perhaps not so widely realised how deeply interested he was in the welfare and status of our profession. He never failed to maintain and defend the dignified nature of our calling both in his public and private utterances, and he reinforced it by a high standard of ethical behaviour towards his colleagues and clients. On matters of principle he was firm and uncompromising, and though all might not agree with his opinions none could doubt the sincerity with which he held them. He would respect a contrary point of view provided it was honest and sincere, but he could be forthright in condemning indifference and insincerity. In the 30-odd years I have been working with him his unfailing thoroughness and enthusiasm have impressed me deeply.

Apart from his professional work he had many other interests ranging from ornithology (from which sprang his study of diseases of birds) to the collection of antique glass and china; his authoritative talks on these enlivened many a lunch hour. His sincerity, coupled with a deep but never ostentatious religious belief, gave him a humane and sympathetic attitude towards his fellow men. By his death I have lost something beyond value; the profession has lost a forceful and untiring protagonist.

Mr. T. A. R. Chipperfield and Mr. H. G. Silcock write:—

The unexpected death of Tom Hare will have been a great shock to many of the students who studied pathology under him at the London College during the late 1920s and early 1930s. The writers of this appreciation are sure that they represent the feelings of many of their colleagues who 'served their time' under him.

Tom Hare, despite his dual qualifications in human and veterinary medicine, was at heart essentially a veterinary surgeon. Further, in his youth, he was a boxer and this we feel is a key to his attitude to life. He started life in his student days under Queensberry Club rules, and he fought throughout his life under these rules, even when others failed to observe them. A deeply religious man, he had a high sense of integrity. With him there were no half-tones, black was black, and white was white. Inevitably he made enemies as well as staunch friends, and this inability to compromise on matters of principle or to adopt diplomatic courses around difficulties undoubtedly led to the denial of high office in the councils of the profession.

Many of his students have cause to be profoundly thankful for the fact that in their third year he was their professor of pathology. He, alone at that time, had the supreme gift of teaching. He lectured in the true university style, painting the background and leaving his students to fill in the details. He encouraged the use of logic and the deductive method. He urged always the critical approach. Above all he sought to teach the true ethical approach to the professional career.

He had a compelling charm of manner and a great interest in the individual. No one went to him for advice or help and came away empty-handed. The friendships formed during his days at the Royal Veterinary College endured in later years when he went into private practice as a veterinary pathologist. He and the late Dr. Leslie Sheather were unique in their generation as veterinary pathologists, and it is doubtful whether any younger men will follow in their footsteps for veterinary pathology is now centred mainly on the veterinary schools, the Animal Health Division, and the Agricultural Research Council.

Throughout his life Tom Hare was active in the political affairs of his chosen profession and for many years he was a member of the Council of the British Veterinary Association. He championed many just causes in his time, but his style of advocacy was too uncompromising for many of his contemporaries. He was, in effect, a really first-class backbencher, often preparing the ammunition for others to fire. In private conversation he advocated the unofficial approach to many of our political problems: he encouraged us to widen our interests beyond the narrow veterinary sphere, and to take up voluntary work within the community in an endeavour to raise the prestige and dignity of the profession in the eyes of the public.

He was the soul of hospitality and at his home in St. Albans, in company with his beloved wife, Joyce, he entertained many of the profession both individually and collectively. The Hertfordshire and Bedfordshire Division of the B.V.A. met frequently at his house and he was never happier than when acting as host to a company of his professional brethren.

We are sure that Tom Hare's teachings did not fall upon barren soil, and that many of his students and friends derived from him inspiration which endures to-day in their professional and private lives. We grieve at his passing, but we shall never forget him. In this hour of grief our hearts go out to Joyce Hare and her family in their great sorrow.

Mr. Harold L. Smith writes:—

Many of my colleagues will share my great sadness at reading of the death of Dr. Tom Hare. I am glad to see that *The Field*, with which he was associated for many years as a consultant pathologist, has been quick to pay a tribute to his wisdom and judgment.

As one who had the privilege of being one of his students during his term of office as professor of pathology at the London College I can well recall the scene during his lectures. His quiet and pleasant voice, going through the catalogue of animal diseases, would suddenly become charged with enthusiasm as he thought of some incident or anecdote with which to flavour his lecture. Perhaps it would be a short dissertation on the beauty of some stained glass which he had seen, or some other branch of the arts of which he was so fond. He and his assistant, Mr. Orr, worked under the most difficult conditions. Inadequate buildings and insufficient equipment made things most trying yet his patience was boundless and he was rarely out of temper.

When he left the college his students felt a deep sense of loss. Spontaneously they subscribed to a fund to show in some small measure their appreciation of their tutor. He indicated that he would like some etchings and these were presented to him at a small ceremony at the college some weeks after he had left. He was greeted on arrival by an enthusiastic group of students and Dr. McCunn, who shook him warmly by the hand. He was deeply moved at the presentation and for once his powers of speech let him down.

In later years his steadfastness in the face of criticism and his single-mindedness in doing all he could to increase the stature of the profession have been an example to us all. We shall miss him very much.

R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

DAVIES, Thomas, of Caerwilym, Felinfach, Lampeter, Cards. Graduated Royal Veterinary College, London, December 19th, 1929; died March 4th, 1959, aged 63 years.

Supplementary Veterinary Register

WILLIAMS, Nicholas John, of Hounslow, Middlesex. Admitted to the Register December 23rd, 1949; died March 31st, 1959.

PERSONAL

Births

ALLARDICE.—On March 23rd, 1959, to Mairi (*née* Stevenson), wife of Andrew S. Allardice, B.V.M.S., M.R.C.V.S., of Mowbray, Craven Arms, Salop, a son, Quentin James.

COOK.—On March 23rd, 1959, to Dolly, wife of Edward R. Cook, M.R.C.V.S., of Stoke Bruerne, Northants, a son, Laurence Cunnington.

GRAY.—On March 19th, 1959, to Gillian, wife of Douglas F. Gray, B.VET.MED., M.R.C.V.S., of "Bayridge," Victoria Road, St. Austell, Cornwall, a son, Andrew.

SANFORD.—On March 22nd, 1959, to Alma, wife of J. Sanford, B.V.SC., M.R.C.V.S., at Liverpool, a daughter, Catherine Elizabeth, sister for Janet.

VICKERS.—On March 1st, 1959, to Margot, wife of Colin Vickers, B.V.SC., M.R.C.V.S., of 23, Stafford Street, Market Drayton, a daughter, Cerys Mary, sister for Ann and Kathryn.

THE LIVE POULTRY (RESTRICTIONS) AMENDMENT ORDER, 1959

As from April 27th, 1959, local authorities in England and Wales will be empowered to issue licences for the movement of live poultry from poulterers' premises to slaughterhouses for slaughter by the Jewish or Moslem methods. Poulterers sending birds for slaughter by these methods should, therefore, apply to their local authority for a licence.

This is the effect of an Amending Order* made jointly by the Minister of Agriculture, Fisheries and Food and the Secretary of State for Scotland.

In addition, the Order amends the definition of a poulterer to include persons carrying on the business of buying and reselling poultry or day-old chicks and who feed them before resale. Persons who keep the birds for at least 28 days before resale for slaughter are not dealers for the purpose of the Order.

* The Order is entitled the Live Poultry (Restrictions) Amendment Order, 1959, and amends the Live Poultry (Restrictions) Order, 1957. Copies of the Order are obtainable from H.M.S.O., price 3d. (by post 5d.).

UNIVERSITY NEWS

Bristol

Second Examination for the Degree of B.V.Sc. (Sections I and II), March, 1959

PASS

*Baker, John Rendle; Barker, John Middleton; Bell, Brian John; Bray, Nicholas; †Edwards, John Christopher; Ford, Christabel Jane; Gould, Leslie Alan; Hall, Florence Elaine; Shepherd, David Arthur Llewellyn; *Spiers, Roger Charles; Wilson, Michael Robert.

* Denotes passed Anatomy with Distinction.

† Denotes passed Animal Husbandry I with Distinction.

In Section II (completing the examination)

Gill, Geoffrey Philip; Herbert, Michael Donald.

Final Examination for the Degree of B.V.Sc. (Section I), March, 1959

PASS

Nelson, Colin Greenwood; Parris, John Christopher; Roach, Michael John; Stewart, Douglas Munro; Vadden, Michael John.

Glasgow

The following passes are announced in the March degree examinations:—

Physiology and Biochemistry

Casserley, J. J.; Logue, J.; Nyarko, D.; Shaw, D.; Stewart, I. A.; Sutherland, G. D. M.; Weir, F.; Wilson, A. F. W.

Anatomy and Histology

Cassar, F.; Casserley, J. J.; Dawe, P. S.; Hughes, R. E.; Logue, J.; Miller, D. J. S.; Nyarko, D.; Shaw, D.; Stewart, I. A.; Sutherland, G. D. M.; Weir, F.; Wilson, A. F. W.; Wilson, R. J. W.

COMING EVENTS

April

7th (Tues.). Reception and Dance of the Shropshire Veterinary Club at the Lion Hotel, Shrewsbury, 9 p.m.

8th (Wed.). Special Meeting of the Sussex Veterinary Society at the Old Ship Hotel, Brighton, 2.30 p.m.

10th (Fri.). General Meeting of the Midland Counties Veterinary Association at the Swan Hotel, Stafford, 2.30 p.m.

15th (Wed.). Meeting of the Warwickshire Veterinary Club in the Regent Hotel, Leamington Spa, 8 p.m.

16th (Thurs.). Meeting of the Herts. and Beds. Veterinary Society at the George Hotel, Luton, 7.30 p.m.

Annual General Meeting of the Lakeland Veterinary Association at the Nag's Head, Kendal, 7 p.m.

17th (Fri.). Meeting of the Yorkshire Veterinary Society at the Hotel Metropole, Leeds, 2.30 p.m.

25th (Sat.). Meeting of the B.S.A.V.A. North West Region at the Stork Hotel, Liverpool.

Annual General Meeting of the Association of State Veterinary Officers in the Auditorium of the Wellcome Research Institute, 183-193, Euston Road, London, N.W.1, 4 p.m.

May

1st (Fri.). Reception and Dance of the Midland Counties Veterinary Association at the Mount Hotel, Tetterhall Wood, Wolverhampton, 9 p.m.

August

30th to 5th September. 77th Annual Congress of the British Veterinary Association in Folkestone. (Official opening Monday, August 31st.)

B.V.A. COMMITTEE AND COUNCIL MEETINGS IN EDINBURGH

Wednesday, April 8th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Farm Livestock Committee.
11.30 a.m. Parliamentary and Public Relations Committee.
2.15 p.m. Small Animals Committee.
5.00 p.m. Finance Sub-committee.

Thursday, April 9th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Home Appointments Committee.
11.30 a.m. Veterinary State Medicine Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, April 10th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Kirkcudbright. Barnwalls, Balmaclellan, Castle Douglas (Mar. 23).
Renfrew. North Brae Farm, Barrhead, Glasgow (Mar. 24).
Salop. Shrawardine Farm, Montford Bridge, Shrewsbury (Mar. 25).
Suffolk. Newholme Farm, Park Hill, Oulton, Lowestoft (Mar. 26).

Fowl Pest

Bucks. Kings Arms Hotel, Amersham (Mar. 23).
Derbys. Monsal Head Hotel, Bakewell (Mar. 25).
Essex. Southview, Lower Park Road, Wickford; 2, Maltings Cottages, Roxwell Road, Writtle, Chelmsford (Mar. 24); Harolds Park Farm, Nazeing, Waltham Abbey (Mar. 25); Poultry Farm Ltd., Downham, Wickford; Chickdene, Ramsden Heath, Billericay (Mar. 30).
Herts. Collett Hill Piggeries, High Oak Road, Ware; 18, Upper Gardens, Ware; 76, Vicarage Road, Ware (Mar. 25); The Garden Nursery, Shenley, St. Albans (Mar. 26); The Maltings, Star Street, Ware; Athenia Gardens, Wadesmill, Ware (Mar. 27); Aston, Stevenage; Bucks Farm, Bayford (Mar. 28); Dunkirk Farm, Hertford; Jenningsbury Farm, Hertford (Mar. 30).
Monmouth. Sailey Rhedyn Farm, Llanfrechfa, Newport (Mar. 30).
Suffolk. Exhibition Farm, Withersfield, Haverhill (Mar. 26).
Surrey. Ivydene, Sturt Avenue, Camelsdale, Haslemere (Mar. 27).
Sussex. Cedrala, Maynards Green, Horam (Mar. 26).

Swine Fever

Ches. Brook Lea, Clotton, Tarporley (Mar. 24).
Dorset. Parkhouse Farm, Chetnole, Sherbourne (Mar. 28).
Essex. 458, Rayleigh Road, Thundersley; Little Marsh Farm, Ramsey, Harwich (Mar. 24); Glebe Road, Ramsden Bellhouse, Billericay (Mar. 28).
Flints. Grange Farm, Kinnerton; Blue Bell, Bodfari (Mar. 24).
Glamorgan. 118, Ely Rive Bank Allotments, Cardiff (Mar. 26).
Gloucs. Rectory Farm, Icombe, Stow-on-the-Wold (Mar. 23); The Nook, Parkend, Lydney; Longmans Barn Farm, Avening, Stroud (Mar. 24); Sydenham Farm, Broadwell, Moreton-in-Marsh (Mar. 28).
Herts. Monks Green Farm, Mangrove Road, Brickenden Liberty (Mar. 23); Little Thele, Great Amwell, Ware (Mar. 24).
Kent. Court Lodge, West Farleigh, Maidstone (Mar. 23).
Lancs. White Gate Farm, Hatton Lane, Hatton, Warrington (Mar. 26).
Leics. Lodge Farm, Cossington; Glebe Farm, Claybrook Parva, Claybrook (Mar. 23); Homebridge Farm, Willistown (Mar. 25).
Oxford. The Piggeries, New Leys Farm, Witney (Mar. 25); Golden Villa, Banbury (Mar. 28).
Salop. The Cinders, Minsterley, Shrewsbury (Mar. 20); Upper Northwood Farm, Chorley, Bridgnorth (Mar. 25); Cross Keys Farm, Brownheath, Ellesmere; Upper House Farm, Chetton, Bridgnorth (Mar. 28).
Somerset. Middle Farm, Wayford, Crewkerne (Mar. 20); Sedgemoor Farm, Ashcott, Bridgwater; Manor Farm, Cannington, Bridgwater (Mar. 23); Danish Piggeries, Easton-in-Gordano, Bristol (Mar. 25).
Surrey. Longlands Farm, Chertsey Lane, Egham (Mar. 28).
Warwicks. Common Farm, Morton Bagot, Studley (Mar. 25).
Worcs. Station Site, Henwick Road, Worcester (Mar. 24); Southwood Farm, Martley (Mar. 25).
Wilts. Borehill, Deverill Road, Warminster (Mar. 23); Court Farm, Gastard, Corsham (Mar. 26).

ADVERTISER'S ANNOUNCEMENT

ALLEN & HANBURYS LTD. have pleasure in announcing that the initial difficulties in meeting the demand for Dictol (Lung Worm Vaccine) have been overcome and supplies are now freely available.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th March, 1959		15	—	—	14	—	49
Corresponding period in	1958	6	—	6	7	—	43
	1957	30	—	2	41	—	42
	1956	183	1	4	23	—	19
1st Jan. to 15th Mar., 1959		50	—	1	195	—	223
Corresponding period in	1958	37	1	97	173	—	212
	1957	102	2	13	232	—	181
	1956	683	3	8	148	—	122